REMARKS

Applicant thanks Examiner Jimenez for his continued consideration of this application, which has been carefully reviewed and amended in view of the October 11, 2002 office action. Applicant further appreciates the Examiner's helpfulness in response to questions discussed by telephone.

Rejections under 35 U.S.C. §102(b)

Claims 1, 3 - 5, 9, 15, 16, 19 - 22, 24, and 25 are rejected by the Examiner under 35 U.S.C. § 102(b), as being anticipated by U.S. Patent Number 4,385,683 by Krupp (Krupp '683). The Examiner states that Krupp '683 teaches a compliant core similar to that claimed by the applicant. The applicant respectfully disagrees and believes that the amended claims clearly do not refer to the same kind of core because Krupe '683 does not teach an elastically deformable core. The passages in Krupp '683, cited by the Examiner refer to an optimum range of sleeve 18 compressibility used to construct a roller assembly 20. The intent of Krupp '683 is to have the sleeve 18 to be inserted and mounted on the shaft. The 10% and 25% compression of values taught by Krupp '683 are tolerance limits, they do not imply variable compression of the sleeve once it is installed in the roller assembly. Krupp '683 intended that once compressed, the sleeve would remain compressed. It explicitly teaches, in the abstract. "A sleeve for frictionally coupling a ceramic disk to a cylindrical shaft. The sleeve is constructed of rigid plastic, preferably ABS, with a void content to permit compression with mounting between the shaft and disk. Krupp, '683, Abstract (emphasis added).

not design

Krupp further discloses the meaning of compressible by stating:

> located between the shaft 12 and the disk 14, in the disclosed preferred embodiment, is the sleeve 18 of tubular shape for coupling the shaft and disk in such fashion as to preclude rotation there between when met with a turning force that as might occur in applications for idle rolls and conveyer assemblies.
>
> Krupp, '683, Col. 2, Lines 62 - 67.

Krupp '683 specifically states that the sleeve should never be over compressed because that would "cause harmful effects on the otherwise non-compressible plastic." Col. 4, Lines 1 - 2.

In other words, Krupp 's shaft and disk are intended to be immovable relative to one another. Therefore, there can be no further deformation of the compressed sleeve into any other configuration, and elastic deformation of the sleeve is obviously precluded. In fact, Krupp '683 explicitly refers to "a rigid foam" (Col. 3, Line 9) and "the rigid plastic compound" (Col. 3, Line 38) for the sleeve material. Therefore, Krupp '683 does nor anticipate any of the claims rejected under 35 U.S.C. § 102(b) since the claims of the Applicant's invention refer to an elastically deformable material.

The present invention's referemce to an elastically deformable core, is summarized by the Applicant on page 3, line 13, to page 4, line 4. The fact that the applicant is describing an elastically deformable material is further demonstrated in the drawings, particularly with reference to the difference in configuration between Figure 2 and Figure 3. The Applicant has amended a potion of the specifications to clarify the meaning of compliant in the specification. The term "elastically deformable" has been used to reinforce the Applicant's meaning of compliant. The Applicant uses elastically deformable when referring to a compliant body which may be deformed when force is applied to the body resulting in one or more stressed configurations, but will return to an unstressed configuration once the force is removed. The specification and the drawings of the current application show that the elastically deformable body may go from a first stressed configuration to a second stressed configuration when the magnitude and/or direction of the force applied to the body changes as shown in the specified

drawings. When the roller rotates under its intended load, the core 44 effectively goes through a succession of stress configurations. The force on the core is exerted in a succession of different directions relative to any given point of the core. If the core were not elastically deformable, the tire could not support the shortening and stretching of the opposed radii referred to above. If the body were permanently deformed, as discussed in Krupp '683, it would not return to its original configuration as required by the current invention, and essentially the roller would be off-set permanently causing permanent damage to the apparatus.

The "elastically deformable" or "compliant" material is further described on page 6, line 18 as "having a tendency to deform significantly in use in a roller assembly 10." The non-compliant material is described on page 6, line 19 as "having a tendency to deform no more than insubstantially in use in the roller assembly." As described here and elsewhere by the Applicant, the non-compliant layer is selected to exhibit a cross-sectional profile that is substantially precluded from changing during operation, whereas the compliant core is selected to be sequentially stretched and compressed upon operable loading, which is in contrast to the non-compliant layer.

These contrasting properties are further described from the bottom of page 8, line 25 through page 9, line 23. On page 8 the unloaded position is described with the result being that "the shaft 30, the compliant core 44, and the non-compliant layer 48 are concentric." Once the loading force is applied, as described on page 9, the applicant's invention accommodates this loading force "through the mechanism of the compliant core 44, which is sequentially stretched and compressed as a tire 40 is rotated." This is done as quoted on page 9, line 16, when:

the radius between the shaft 30 and the non-compliant layer 48 is a constant concentric radius prior to loading, biasing or offsetting the shaft. Upon operable loading, the shaft 30 is displaced from the concentric position by the offset distance. Thus, during operation, while the dry image of the non-compliant layer 48 remains constant, the radius to the shaft varies from the concentric radius to the concentric radius plus the off-set distance, to the concentric radius to the concentric radius minus the off-set distance, then to the concentric radius.

This is also shown in Figure 2 and Figure 3 as discussed above. The Applicant's invention has elastically deformable or compliant core allowing deformation and a non-compliant material that has a smaller variation of deformation in cross-sectional area which is preferably near constant upon rotation in the loaded state.

Claims 1 - 6, 8 - 11, and 20 - 25 were rejected by the Examiner as being anticipated by Okumura, at al., U.S. Patent Application No. 4, 517,719 (Okumura '719). Okumura '719 does not anticipate this present application because the core described in Okumura '719 is formed from a thermal setting resin (Col. 4, Lines 29 - 30), which by definition is not <u>elastically deformable</u>. Okumura, et al., in fact, teaches away from elastic material. Referring to the abstract in Okumura, which states that "a magnetic roll having a plurality of magnets intricately set fast with the retaining member at stated portions of the periphery of a roll shaft . . ." Okumura, '719

Okumura '719 further states at Col. 3, Lines 64 to Col. 4, Line 17 that:

> <u>In the retaining layer 4, magnets 2, 3a - 3e are set fast in position. If the magnets 2, 3a -3e are suffered to produce any positional deviation, then the magnetic brush developing roll will have its copying property affected accordingly. For this reason the accuracy with which magnets 2, 3a - 3e are attached to the retaining layer 4 has its significance. In this respect, the use if a soft synthetic resin or synthetic resin foam as the material for the retaining layer 4 should be avoided. . . .</u> <u>If the</u>

> <u>retaining layer 4 is made of a material abounding with elasticity, therefore, the retaining layer 4 is gradually deformed by the aforementioned attracting force and the positions at which the magnets 2, 3a - 3e are disposed or accordingly changed. As a result, the developer attracting property is affected and the copying property is adversely affected. From this point of view, an elastic material which is readily deformed should not be adopted as the material for the retaining layer 4.</u> (emphasis added)

The Examiner states in paragraph 13 of the Final Action that "the core 4 of Okumura, et al. is made of an open cellular structure that is made form polyurethane . . . which is the same material that the claimed invention is made of. Therefore, the core of Okumura is clearly complaint." The applicant strongly disagrees with this conclusion. It is well known in the art that polyurtheyne foams can be made flexible or rigid depending on its particular composition. In other words, the fact that an article is made from polyurtheyne foam does not in and of itself, define whether or not it is "compliant." The intent of Okumura, et al. is clear. Okumura states that <u>the retaining layer 4 is meant to be inflexible so as to keep the magnets in place, and is therefore, precluded from being compliant or elastically deformable</u>, as described in the present invention. Therefore, the disclosure of Okumura '719 does not anticipate any of the claims rejected under 35 U.S.C. § 102(b).

The Examiner under 35 U.S.C. § 102(b) rejects claims 1,-3 - 10, 13, and-20 - 25 as being anticipated by Blackwood, U.S. Patent 4,440,295, which also refers to an allegedly compliant core formed of polyurethane foam. As was discussed above in connection with Okumura, et al., it is well known that polyurethane foams can be made either flexible or rigid. Blackwood, et al. '295 no where teaches that an elastically deformable or compliant core 2, in fact Blackwood'295 discloses the opposite quite clearly in Col. 4, Lines 1 - 6 stating "The physical properties including that of the density of the core material are not critical since the core is not intended to possess load-bearing properties, but is intended only to act as an internal former and a space filler for the shell of the idler roller. <u>Typically the core is made from a rigid polyurethayne foam . . .</u>." Since elasticity only becomes an issue when a load is exerted, and since the core material in Blackwood, et al. '295 is intended only as a filler and not to possess load-bearing properties, there is no suggestion that elasticity is even considered in the Blackwood, et al. '295 reference.

The Examiner further stated in the response to applicant's arguments (¶ 14 of Final Action) that: Applicant argues that Blackwood, et al. do not teach a compliant core. However the core-2 is made of a foamed polyurethane "elastic range" (Col. 5, Lines 16 - 17). Therefore, the core is fairly compliant. Furthermore . . . applicant even suggests that all materials are more or less compliant (see, page 6, lines 20 - 21 of the applicant's specifications). The claims do not preclude the core material of Okumura, et al. from being compliant.

Final Action at Paragraph 14.

Applicant respectfully submits that Examiner is in error identifying the compliant element of the Blackwood reference. It is clear that Blackwood, at al. in Col. 5, lines 11 - 17, and in Col. 2, Lines 28 - 30, is referring to the polyurethane used in the shell, not the core, of the Blackwood invention. This is consistent with what is stated in Col. 2, lines 28 -30, which reads: "in the preferred embodiment of the invention the polyurethane employed for the formation of the shell is a material in the elastomer range." and further confirmed with the language in claim 7 which states " the idler roller of claim 1 in which the shell comprises a polyurethane material in the elastomer range." Blackwood, therefore, cannot be construed as anticipating any of the claims rejected under 35 U.S.C. § 102(b).

To reiterate, while Okumura '719 and Blackwood '295, both teach a polyurethane element which has been equated with the applicant's core, neither Okumura '719 nor Blackwood '295 teach that this element is compliant of elastically deformable as required in applicant's invention. The applicant has shown that both of these references teach away from the element being compliant or elastically deformable.

Claims 2, 6, 7, 11, 13, 17, 18, and 23 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Krupp. As discussed above, the independent claims 1, 20, 22, and 25 should be allowed since they are not anticipated by Krupp, Okumura, or Blackwood. Since the independent claims 1 and 22 are in condition for allowance over Krupp, as stated above, the dependent claims which depend from claims 1 and 22, should also be allowed. The claims rejected under 35 U.S.C. § 103(a) are clearly distinguishable relative to all the cited references.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**<u>Version with markings to show changes made</u>.**"

Accordingly, in view of the above amendments and comments, Applicant submits that all the pending Claims 1-25 are in condition for allowance, which action is respectfully requested.

Therefore, the applicant requests that the Examiner allow all claims in this application. the Entry of the present amendment is earnestly requested.

Respectfully submitted,

HARTER, SECREST & EMERY LLP

By: Donna P. Suchy

Donna P. Suchy
Reg. No. 47,979
Harter, Secrest & Emery LLP
1600 Bausch & Lomb Place
Rochester, New York 14604-2711
Telephone No.: (585) 231-1101
Fax No.: (585) 232-2152

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

On page 6, please amend the paragraph extending from line 13 to line 25 to read:

A tire 40 that deforms significantly at the nip is referred to as a compliant tire, whereas a hard tire, which does not deform significantly at the nip, is understood to be non-compliant. [It is recognized that all tires deform to some extent but the distinction between compliant and non-compliant tires is well understood by those skilled in the art and useful in describing this invention.] As used herein, compliant means having a tendency to deform significantly in use, particularly in a roller assembly 10, while non-compliant means having a tendency to deform no more than insubstantially in use, particularly in a roller assembly. The compliant behavior can be understood by referring to Figures 2 and 3. Figure 2 depicts the tire 40 in the unloaded (concentric) state. Figure 3 depicts the tire 40 a loaded state in which the compliant core 44 is elastically deformed. While the sheet material 12 is not shown in Figure 3, it is clear that the contact between the tire 40 and the sheet material 12 must be at the at the lowest point of the drawing, since the non-compliant layer is offset upward. Figure 3 is a "snapshot" of the tire 40 in a single position of the loaded state. Clearly, as the tire 40 rotates, the compliant layer 44 will experience continual elastic deformation to accommodate the illustrated offset.

[It should be recognized that in an absolute sense, all materials are more or less compliant and that as used herein, material is compliant or non-compliant depending on the extent to which it deforms in the transport mechanism of the invention. Preferably, the material forming the compliant core provides for an amount of shear, in contrast to the non-compliant material, which exhibits substantially no shear.]

In the Claims:

Please amend the claims as follows:

1. (Twice Amended) A roller for a roller assembly, the roller comprising:

(a) a shaft; and

(b) a first tire mounted relative to the shaft, the first tire including:

(i) <u>an elastically deformable</u> [a compliant] core affixed relative to the shaft for rotation with the shaft; and

(ii) a non-compliant layer connected to the core for rotation with the core.

2. The roller assembly of Claim 1, wherein the shaft comprises a plastic shaft.

3. The roller assembly of Claim 1, wherein the shaft has a linear variance less than .03 inches per linear foot.

4. (Once Amended)The roller assembly of Claim 1, wherein the <u>elastically deformable</u> [compliant] core comprises a cellular structure.

5. The roller assembly of Claim 4, wherein the cellular structure has an open cell structure.

6. The roller assembly of Claim 4, wherein the cellular structure comprises polyurethane.

7. The roller assembly of Claim 1, wherein the non-compliant layer comprises a layer of elastomeric material.

8. The roller assembly of Claim 1, wherein the non-compliant layer has a durometer less than 60 Shore A.

9. The roller assembly of Claim 1, wherein the non-compliant layer has a durometer greater than 35 Shore A.

10. The roller assembly of Claim 1, wherein the non-compliant layer has a durometer greater than 35 Shore A and less than 60 Shore A.

11. The roller assembly of Claim 1, wherein the non-compliant layer includes a metal tube.

12. (Once Amended) The roller assembly of Claim 11, comprising a layer of coefficient of friction enhancing material on the metal tube.

13. The roller assembly of Claim 1, wherein the non-compliant layer comprises a plastic tube.

14. (Once Amended) The roller assembly of Claim 13, comprising a layer of coefficient of friction enhancing material on the plastic tube.

15. The transport mechanism of Claim 1, comprising a second tire mounted on the shaft.

16. (Once Amended) The roller assembly of Claim 15, wherein the second tire comprises:

(a) <u>an elastically deformable</u> [a compliant] core; and

(c) a non-compliant layer on the core.

17. The roller assembly of Claim 16, wherein the non-compliant layer comprises a layer of elastomeric material.

18. The roller assembly of Claim 16, wherein the non-compliant layer comprises a layer of synthetic rubber.

19. The roller assembly of Claim 16, comprising a coefficient of friction enhancing surface on the non-compliant layer of one of the first tire and the second tire.

20. (Twice Amended) A tire for a roller for transporting a sheet material, the roller including a shaft, and having an unloaded state and a loaded state, the tire comprising:

(a) <u>an elastically deformable</u> [a compliant] core connected relative to the shaft for rotation with the shaft; and

(b) a non-compliant layer connected to and surrounding the <u>elastically deformable</u> [compliant] core and the shaft, the <u>elastically deformable</u> [compliant] core and the non-complaint layer being concentric <u>in the unloaded</u> configuration, and the shaft being offset from the concentric state in the loaded state, the non-compliant layer selected to preclude a deformation of the non compliant layer in the loaded state sufficient to induce skewing or scuffing of the sheet material upon contact with the sheet material <u>thus minimizing the skewing or scuffing of the sheet material</u>.

21. (Once Amended) The tire of Claim 20, wherein the non-compliant layer has a constant cross section between the unloaded state and the loaded state.

22. (Once Amended) A roller having an unloaded concentric configuration and a loaded non-concentric configuration, the roller comprising:

(a) a shaft;

(b) a non-compliant layer; and

(c) <u>an elastically deformable</u> [compliant] core intermediate the non-compliant layer and the shaft, the <u>elastically deformable</u> [compliant] core selected to produce a varying annular segment size of the <u>elastically deformable</u> [compliant] core and the non compliant layer selected to produce a constant annular segment size during rotation of the shaft in the loaded non-concentric configuration.

23. The roller of Claim 22, wherein the non-compliant layer is one of a metal tube or a plastic tube.

24. (Once Amended) The roller of Claim 22, wherein the <u>elastically deformable</u> [compliant] layer has a cellular structure.

25. (Twice Amended) A tire for a roller, comprising:

(a) a hub; and

(b) a first tire mounted on the hub for rotation with the hub, the first tire including:

(i) <u>an elastically deformable</u> [a compliant] core affixed to the hub for rotation with the hub; and

(ii) a non compliant layer connected to the core for rotation with the core for rotation with the core.